The Design of A DSS For The Selection of ERP System And Consultant

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Abstract:
Investing in ERP is very expensive and yet risky on top of current and future resources needed to be allocated for the project. ERP implementation failures have a serious negative impact on organizations and this make the task of choosing the right ERP system very crucial. Furthermore, once an organization has purchased an ERP software, they are literally stuck with that system forever, due to the high initial investment. If the purchased ERP system is unable to support any future business requirement, then it would be a total waste. In this paper we describe our efforts in designing and developing a Decision Support System (DSS) tool that can assist organizations to select the best ERP system and consultants for themselves. We call the *Selection and Evaluation of an Enterprise Resource Planning Based Systems* tool SEEBAS. It is a non bias DSS tool which can help decision makers to make better decision in selecting the most suitable consulting company to assist them during the entire project implementation. Utilizing SEEBAS will reduce the risk of selecting an unsuitable ERP system, enable all decision makers in an organization to use the same decision making tool thus contributing towards transparency, avoiding biasness and have a systematic way of selecting an ERP system and consulting company for the organization.

Keywords: Enterprise resource planning (ERP), Decision Support System (DSS), Performance Key Indicator (PKI)

1.0 Introduction

In the present day of global economy, for a business company to survive and remain competitive, the quests to satisfy customers and reduce cost are given priority. For these organizations, their business processes must be efficiently managed and the data flow between all supporting information systems must be smooth. This can be achieved if these information systems are integrated and the whole business enterprise assesses a common data repository. With these requirements came the emergence of Enterprise Resource Planning System.

An enterprise resource planning (ERP) system is a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information-processing needs. O'Leary (2000) defined ERP as a *computer-based*

systems designed to process an organization's transactions and facilitate integrated and real-time planning, production and customer response. It has been proven beneficial such that more and more companies are adopting it. One study found that more than 60% of Fortune 500 companies had adopted ERP systems. (Stewart et al, 2000).

Minahan (1998) pointed out that ERP systems can cost a fortune, take years to install, force the changing of basic business processes, and not provide a return for years. So why are so many companies buying them? The benefits of ERP implementation experienced by organizations can be examined from the technical, financial and organizational perspectives. From the technical viewpoint, integrating all aspects of an organization's computing is attractive because it fosters consistencies across the system through the use of single-source files and efficiency through making single data entry possible for all of the organization's applications. From the financial standpoint, ERP promises economic savings through integrating all applications into one big system. From an organizational point of view, ERP enables all members of the organization to learn to use the same system, thus enhancing intra-organizational communication and collaboration (Olson, 2004). Bakry and Bakry (2005) have introduced the notion of viewing ERP from the 'Strategy, technology, organization, people and environment or STOPE framework.

Basu and Lederer (2004) noted that post-ERP implementation experiences have often been frustrating for client organizations with wasted time, effort, and money. These disappointments in turn have created problems for consultants because they sought satisfied clients in order to maintain their reputations and produce more consulting business. Skok and Legge (2001) conducted a study on ERP evaluation using an interpretive approach. They noted that there has been a notable decrease in the satisfaction levels of ERP implementations over the period of 1998-2000. Brown (2004), investigated the planning and structure of ERP implementation and pointed out that besides management and technical issues; project structure, communication and change management, and documentation handling, all contribute to the recipe for ERP success. Ifinedo and Nahar (2006), were the first researchers to investigate the perspectives of key organizational stakeholders with respect to the success of their ERP software. Their major finding is there is no difference in organizations, whether business or social, on measures of ERP success.

Over the years, more and more companies in Malaysia invested highly on IT in order to keep abreast with the latest business tools in the market. Since there are numerous ERP providers in the market, it is a challenge for organizations to select the most appropriate ERP system. All ERP vendors claim that their products are state-of-the-art systems and can be easily tailored to any organization's unique requirements. Investing on an ERP system is a major decision and organizations need to be extremely careful. Once a decision has been made on the choice of ERP system and consultants, the organization has to make it work. Is there a systematic way of selecting the best ERP system and ERP

consultants? Is there a DSS that can help decision makers and make the whole process transparent and unbiased? Our research work is aimed towards fulfilling these requirements. We have conducted a survey to investigate what end-users of ERP systems consider as the ideal characteristics of an ERP system and its implementation. The findings of the survey have been used in the development of SEEBAS. The data in tables 1 – 4 are derived from this study.

2.0 The Proposed DSS Tool

The Internet has changed the way we worked. Organizations no longer work alone but instead they collaborate with their business partners, suppliers and their distributors. Due to this nature, we have opted to develop a web-based DSS tool. We call the tool, SEEBAS which is the acronym for *Selection and Evaluation of an Enterprise Resource Planning Based Systems*. It is a non bias DSS tool which can assists decision makers to make better decision in selecting the most suitable consulting company to assist them during the entire project implementation. The proposed tool will be developed into two phases:-

- ✧ Phase 1: Evaluates the candidate ERP system and consultant.
- ✧ Phase 2: Evaluates the performance of the candidate ERP system.

Phase 1: Evaluating the candidate ERP system and consultant.

Procuring an IT based system is expensive and not an easy task. Buying a machine can be easily linked to the product that can be produced, but an IT investment is totally different. It cannot be easily linked to the end product. Its benefits are more intangible in nature, thus making IT professionals difficult to justify IT investment to the top management. According to Schniederjans et al (2004), there are four categories of IT related techniques of making investment decision:

- Financial Techniques such as payback period, net present value (NPV) and internal rate of return (IRR).
- Operations Research/Management Science Techniques such as Analytical hierarchy process, game theory, Simulation, Multi criteria approaches etc.
- Techniques specially designed for IT evaluation such as Bedell's method, Buss's method, automatic value points etc.
- Other techniques for IT evaluation such as balances scorecard, critical success factors etc.

Renkema and Berghout (1997), introduces the Multi-Factor Scoring Method (MFSM) technique. It is a collection of quantitative methodologies that can be used to make a choice from a set of alternatives using a set of two or more factors as decision choice criteria. The alternatives represented should be mutually exclusive and discrete choices. It means that each alternative or solution should be able to do the same task it is asked to do. For example, evaluating two proposals submitted by two companies for the same human resource management (HRM). The HRM system proposed should have its own advantage and it is evaluated according to the factors determined earlier by the appointed selection committee. There are many types of MFSM but generally

it can be divided into two categories namely:

- The unweighted MFSM. Here, the ratings are simply summed up to achieve a score that will denote the desired choice of alternatives. The rating could be any number such as a scale from 1 to 9 or 1 to 100. The smallest number i.e. number 1 represents a "poor rating" and the highest number i.e. 9 or 100 represents a "good rating" in satisfying that factor.
- The weighted MFSM. Here, the only difference is that, the factors are given a weightage that represents its importance to the whole decision process. It is more likely in real-world problems that these factors will have differing weights because of unique organizational or system requirements on IT (Schniederjans et al, 2004). For budget constrained company, the price factor is a higher concern than a brand factor. Weightage is subjective in nature and it varies from one company to another. The weight factor could be determined from previous studies, management's intuitive, or expert's opinion. Weightages are usually expressed as decimals or percentages and they must add up to 1.0 or 100 percent over all the factors being considered in the problem. These weights are multiplied with the score of each factor obtained by the evaluated companies.

For SEEBAS, a weighted MSFM is used and the steps are as follows:

- Identify all alternatives choices.
- Identify all relevant factors.
- Identify, judgmentally derive, or compute factor weights for each factor.
- Construct an MFSM table with individual columns for each alternative and one additional column labeled Factor Weights, rows for each factor, and final row labeled Total Score.
- Rate each alternative using a scale of choice (e.g., 1 to 7), where the lower value on the scale represents a less preferred value and the higher value represents a more preferred value for each factor.
- Place the ratings by row and column in each cell that makes up the table.
- Place the factors weights in the Factor Weight column.
- Multiply the factors weights in the Factor Weight column times each of the ratings across each row, and place those values in each of the rating cells of the table.
- Sum these computed ratings by column (e.g., each alternative) to generate a total score and place these values in the Total Score row at the bottom of the table.
- Select the alternative with the largest total score.

Phase 2: Evaluating the performance of the ERP System

We develop SEEBAS so that organizations can use it to:

1. Have a systematic method in assessing the performance of ERP system.
2. Have a proper method in recoding any mishap with regard to ERP system.

3. Assist decision makers on the effectiveness of their current ERP software so that all possibilities and requirements all looked into prior to future expansion.
4. Continuously engaged consultants or terminate their services if their services not up to value of services.
5. Enable Stakeholders to have a proper methodology to apply for evaluating the performance of ERP system.
6. Provide non bias system to assist decision makers to record, understanding and evaluating any ERP system.

3.0 SEEBAS is made up of three modules: Introduction and Administration module, Selection and Evaluation of Software and Consultant module, and the Selection and Evaluation of Software and Consultant Module

3.1 Introduction and Administration Module

The tool is comprised of three basic modules; selection; evaluation; and results. The SEEBAS's url is tentatively at www.seebas.com. Once the prospective user opens this website, the user is requested to log in first. The requirement to register first is necessary in order to make the website more formal and professionally administered. In this module, there are several sub sections. These sub sections are divided a follows:

User Information

The user is required to key in the spaces in the online form. This brief information about the user is basically for future reference and comparison. Once they completed the registration, then they are allowed to use the system. The information required as follows:

- Username
- Company
- E-mail address.
- Years of ERP experience

Software Weighted Score

In this module, the administrator is required to key in the requested information in the spaces available. The score according to the items asked are as in Table 1. :

Table 1: Weightage for Software Characteristics

No.	**Software Characteristics**	**Weightage**
1	Software Origin	2.0
2	History of Software	2.5
3	Reputable Client	1.5
4	Local Support	3.5
5	Ability of System to Grow	3.0
6	Flexibility of Customization	5.0
7	Suitability of Future Business Requirement	2.5
8	System Suitability with Organizational Business Requirement	6.5

Consultant Weighted Score

Similarly for the selection of the consultant. The score according to the items asked are as in Table 2:

Table 2: Weightage for Consultant Characteristics

No.	Consultant Characteristics	Weightage
1	Consultant Based	2.0
2	Date of Incorporated	4.0
3	Number of Technical staff	5.0
4	Average Working Experience	6.0
5	Previous and completed project	4.0
6	Current Project on going	4.0
7	Scope of Works	3.0
8	Project Commitment	5.0
9	Project Planning	5.0

3.2 Selection and Evaluation of Software and Consultant Module

The selection criteria used for software and consultant evaluation can be summarized in the Table 3:

Table 3: Software Selection and Consultant Criteria

Software selection criteria	Consultant selection criteria
1. Reputation	1. Consultant's Location
2. Local Support	2. Date Incorporated
3. System's platform	3. No. of Technical Staff
4. Ability to grow	4. Working Experience
5. Customization	5. Completed Project
6. Suitability	6. Current Project
7. Cost and Maintenance	7. Commitment
8. Vision and Mission	8. Planning
9. Improve transaction	
10. Impact on Workforce	
11. Reduce Problem	
12. Increase Services	
13. Optimum Resources	

3.3 Evaluation of ERP Investment Module

This module is used to evaluate the performance of an ERP system. The ERP system needs to be evaluated because:

a) Investing in an ERP system involves high capital and the outcome from its investment should be higher than the cost of implementing it.
b) Need to evaluate the effectiveness of the ERP system in addressing problems faced by legacy systems.
c) To justify its investment.
d) For future reference when further investment is needed since the ERP system is continuously evolving.

Through the result from this exercise, the management can take appropriate measures to further enhance the system or if the results are unsatisfactory, then the weaknesses can be rectified either

through retraining or further collaboration with the consultants. In this module, there are two sub modules used to evaluate the ERP system. These two modules are:

- Key Performance Indicators (KPI) of Perceived Attainable Intangible Benefits
- Key Performance Indicators (KPI) of Productivity Indicators

Key Performance Indicators (KPI) of Perceived Attainable Intangible Benefits

This is derived from a previous survey on Malaysian Manufacturing organizations adopting ERP. The items being asked in this sub module can be summarized as in Figure 1.

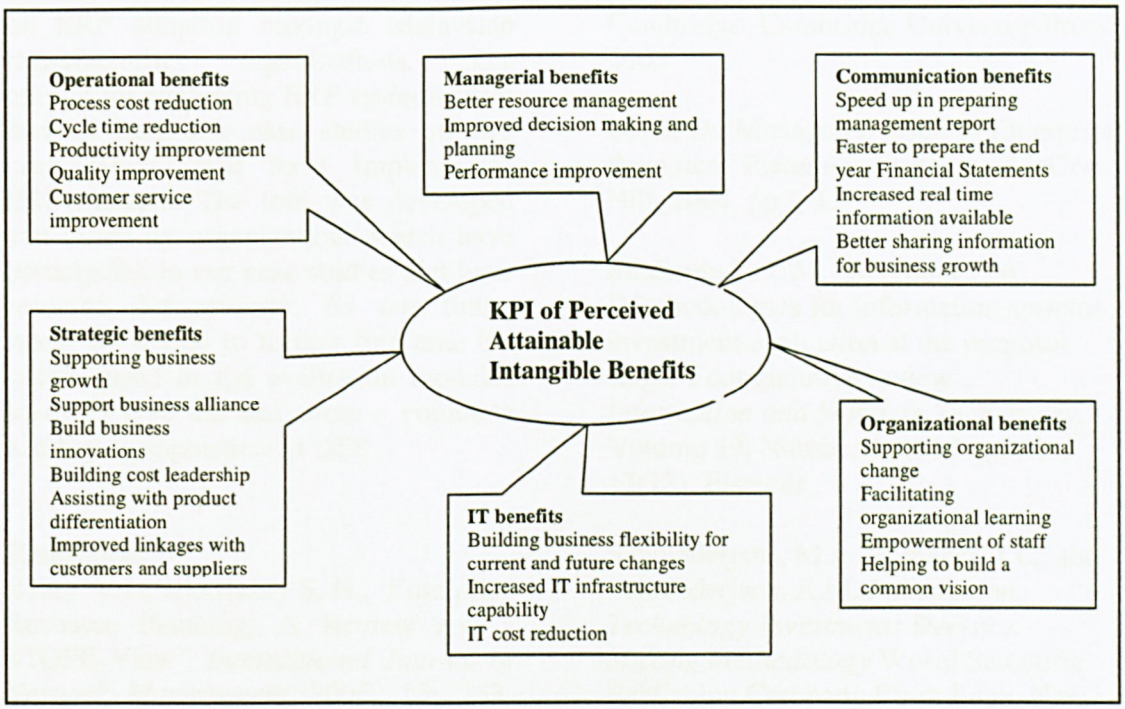

Figure 1: Framework for ERP Evaluation (KPI Attainable Benefits)

b) KPI Productivity Indicators

In total, there are eight indicators used as derived from the analysis of data gathered from the survey. These indicators are reproduced as in Table 4 below:

Table 4: KPI Indicators

No.	Indicator	Formula
1.	Labour Cost Competitiveness (LCC)	Added Value / RM of Labour Cost
2.	Labour Cost per Employee (LCE)	Labour Cost / Number of Employee
3.	Unit Labour Cost (ULC)	Labour Cost / Total Output
4.	Labour Productivity (LP)	Added Value / Number of Employees
5.	Total Output per Employee	Total Output / Number of Employees
6.	Capital Productivity (CP)	Added Value / Fixed Assets (IT related equipment)
7.	Capital Turnover	Total Output / Fixed Assets (IT related equipment)
8.	Capital Intensity (CI)	Fixed Assets (IT related equipment) / Number of Employees

4.0 Discussion and Conclusion

In this paper we have presented our research on designing a web-based, non biased DSS tool to assist decision makers when they are considering investing in an ERP system, selecting an ERP consultant and evaluating the performance of their ERP system. The criteria that have been used to assess the ERP system and ERP consultants were derived from the findings of our survey on ERP adoption amongst Malaysian manufacturing organizations. The criteria for evaluating ERP systems were derived from our case studies on two organizations that have implemented ERP systems. The tool was developed and tested by organizations which have participated in our case studies and have received fair reviews. As our future work, we intend to further fine tune the criteria used in the evaluation modules so as to give the end users a complete and highly sophisticated DSS.

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